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NOTES ON TWO RARE *SOLIDAGO* (ASTERACEAE) IN TENNESSEE: *S. ARENICOLA* AND *S. SIMPLEX*

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ABSTRACT

Solidago simplex subsp. *randii* var. *racemosa* is reconfirmed as a member of the Tennessee flora. *Solidago arenicola* is similarly confirmed although there are minor morphological differences between the Tennessee plants and typical plants from Alabama. *Solidago arenicola* in Tennessee is disjunct by about 300 kilometers from the type locality in Alabama and by about 370 kilometers from a reported occurrence in Kentucky, the only other known areas of distribution for the species. *Solidago simplex* and *S. arenicola* in Tennessee are distributed on two separate river systems of the Cumberland Plateau.

KEYWORDS: *Solidago arenicola*, *Solidago racemosa*, Tennessee, Obed River, Big South Fork

The recent floristic checklist of Tennessee (Chester et al. 2009) reported *Solidago arenicola* Keener & Kral based on material from two counties, Morgan and Scott, both of the Cumberland Plateau physiographic province where they grow along river-scoured rocky margins or on cobble bars. The present report of *S. arenicola* in Tennessee is due to the referral of the Tennessee populations to that species by Semple and Cook (2006) and their suggestion that the identity of the plants needs confirmation.

Specimens at TENN were annotated to *Solidago arenicola* by Dwayne Estes based on a presumption of their identity fide Semple and Cook (2006) and their comparison to an isotype at TENN. Peirson et al. (2012) confirm the presence of *S. arenicola* in Tennessee based on cytological data that shows the Tennessee and Alabama populations are tetraploid ($2n = 36$) and morphologically similar. Formerly, all of these specimens had been annotated as *S. erecta* Pursh, *S. spathulata* DC., a variety or subspecies of *S. simplex* Kunth., or as *S. uliginosa* Nutt. Chester et al. (1997) treated all as *S. simplex*. For both Scott and Morgan counties, other accounts include either *S. simplex* (USDA, NRCS, 2012) or *S. arenicola* (Semple & Cook 2006; BONAP 2011).

Examination of Tennessee material annotated as *Solidago arenicola* indicates that two distinct taxa are represented by these collections — one tentatively identified as *S. arenicola* (having glabrous cypselae), the other as *S. simplex* Kunth subsp. *randii* (Porter) Ringius var. *racemosa* (Greene) Ringius (with strigose to shortly pubescent cypselae).

Solidago arenicola was described from a single population in Alabama (Keener & Kral 2003). Its habitat is sandy alluvium of the Locust Fork River shore, where inundation and drought both are frequent during summer. *Solidago arenicola*, *S. kralii* Semple, and *S. plumosa* Small (all of subsect. *Humiles* (Ryd.) Semple) have glabrous cypselae (Keener & Kral 2003). *Solidago arenicola* is distinguished from *S. plumosa* by its small capitula and longer cypselae and from *S. kralii* which has leaves and arrays abundantly viscid.

In Tennessee, *Solidago arenicola* occurs in Morgan County along the Obed River and tributaries, which drain to the Emory River. It is disjunct to sandy bottoms of Whites Creek in Roane County which is downstream from where the Emory and Clinch Rivers drain into Watts Bar Lake, a reservoir damming the aforementioned rivers and the Little Tennessee which eventually reaches the Mississippi drainage via a circuitous route through Alabama. It is in Alabama that this river system approaches the Alabama populations of *S. arenicola*. It is likely that this route assisted the species migration and evidence of this may be recovered from molecular phylogeographic work. In contrast, *S. simplex* var. *racemosa* occurs along a limited area of the Big South Fork of Scott County which drains northward into the Cumberland River and thence to the Mississippi drainage.

Recognition of *Solidago arenicola* in Tennessee remains problematic, however, due to morphology outside the ranges of the original species description. Although the Tennessee plants key to *S. arenicola* and share the larger capitula with fewer per inflorescence following Keener & Kral (2003), they differ in several morphological features (Table 1). Significantly, the involucres in the specimens examined are never longer than 7–8 mm, whereas in typical *S. arenicola* they can reach 12 mm. Moreover, the disc floret number is consistently less (6–10) than in *S. arenicola* (11–16) from the type locality. Glandular vestiture in the inflorescence of *S. arenicola* was noted by Keener and Kral (2003) but an isotype (TENN) does not show minute glands at 40x magnification. Glandular vestiture is not discernible on live plants (cultivated) of the Tennessee plants. Nonetheless, *S. arenicola* from Alabama and Tennessee are cytologically similar (Peirson et al., 2012).

The distinction of the Tennessee plants from *Solidago erecta* (subsect. *Squarrosae* A. Gray) is unambiguous. Plants of *S. arenicola* in Alabama and Tennessee are rhizomatous, forming numerous basal rosettes from slender rhizomes terminating in caudiciform growth; those of *S. erecta* have an erect, non-rhizomatous root. Both the Tennessee plants and typical *S. arenicola* have glabrous leaf margins, while *S. erecta* has scabrellous margins. Also, compared to *S. erecta*, *S. arenicola* has fewer heads per stem, longer involucres, and more disc flowers per head (Table 1). *Solidago erecta* occurs in dry uplands while the others occur in wet, sandy bottoms.

	arenicola (Tenn.)	**arenicola** (Ala.)	**erecta**
rhizome	horizontal	horizontal	erect
heads per stem	15–95	10–50	15–350
leaf margin	glabrous	glabrous	ciliate-scabrellous
inflorescence vestiture	eglandular	glandular	eglandular
involucre length (mm)	7–8	7–12	3.5–6.5
ray florets	8–10	6–10	5–9
disk florets	6–10	11–16	6–10
corolla length (mm)	4–5	5–6	3–4
cypselae (mm)	3–4	1.5–4	2.5

Table 1. Comparison of relevant morphological features between *Solidago arenicola* in Tennessee, typical *S. arenicola* from Alabama, and *S. erecta*. Data are taken from specimens at TENN and from Semple and Cook (2006) and Keener and Kral (2003).

Dissimilarities place the Tennessee plants outside of the circumscription of *Solidago erecta*, but ecology and morphology suggest that they are closely related to *S. arenicola* and they are included here in a broadened taxonomic concept of *S. arenicola*. Alternatively, the taxonomic

status of these plants in Tennessee should be further investigated toward the possibility that they have arisen independently of *S. arenicola* in Alabama.

Collections examined. *Solidago arenicola*. **USA. Alabama**. Blount Co.: 1.5 air mi WNW of Cleveland, 7 Sep 2002, *Kral 93190* (isotypes: image MO, image NCU, TENN). **Tennessee**. Morgan Co.: Obed National Wild and Scenic River Park. 4.2 air mi SW of Wartburg, where Catoosa Rd crosses Emory River at Nemo Bridge, N of Bridge on W side of river, sandy cobble bar, 36° 04' 10" N, 84° 39' 47" W, 12 Oct 2005, *Estes, Wofford, and Beck 08551* (TENN); same location and date, *Estes, Wofford, and Beck 08552* (TENN); same location and date, *Estes, Wofford, and Beck 08548* (TENN); common boulder bar element along N bank of Obed River just upstream from McMilligan Branch, Lancing Quad (1967), 29 Sep 1980, *Patrick & Schmalzer 1607* (TENN); gravel bar with shrub-herb community on S of Clear Creek about 0.4 mi downstream from bridge on St. Rt. 4252 (Jett Bridge), Lancing Quad, 20 Aug 1980, *Schmalzer 1615* (TENN); Clear Creek at Lilly Bridge, mesic slopes, 17 Sep 1989, *McNeilus 89-1038* (TENN); sandy soil along Emory River at Camp Austin N of Oakdale, 16 Sep 1970, *Somers., Bowers,* and *Wofford 46460* (TENN); sandy soil along Clear Creek, just SW of bridge along Hwy 4252, ca. 5 mi W of Lancing, 29 Aug 1977, *Webb, Wofford,* and *Patrick 1069* (TENN); gravel bar with shrub-herb community on E side of Emory River just upstream from Nemo Bridge, Lancing Quad, 1 Oct 1980, *Schmalzer 1617* (TENN). Roane Co.: sandy bottoms along Whites Creek, 13 Oct 2010, *Pounds s.n.* (TENN).

Solidago simplex. **USA. Tennessee**. Scott Co.: Big South Fork National River and Recreation Area, growing along sandy shore on E bank of BSFR, near Angel Falls, 15 Sep 2001, *Durr s.n.* (TENN); BSFR, 0.5 mi downstream from Leatherwood Ford, 14 Oct 1988, *Schell s.n.* (TENN); BSFNRRA, bank of the Clear Fork of the Cumberland River, 36° 24' 48" N 84° 37' 24" W, 1 Sep 1999, *Beck 478* (TENN); open, gravel and boulder areas along the BSF, Honey Creek Pocket Wilderness area, 12 Sep 1984, *Wofford 84-57* (TENN); BSF 2 mi up from Leatherwood Ford at O&W RR trestle, rocky bars and banks, bracts yellow-green, 14 Oct 1978, *Somers 1577* (TENN).

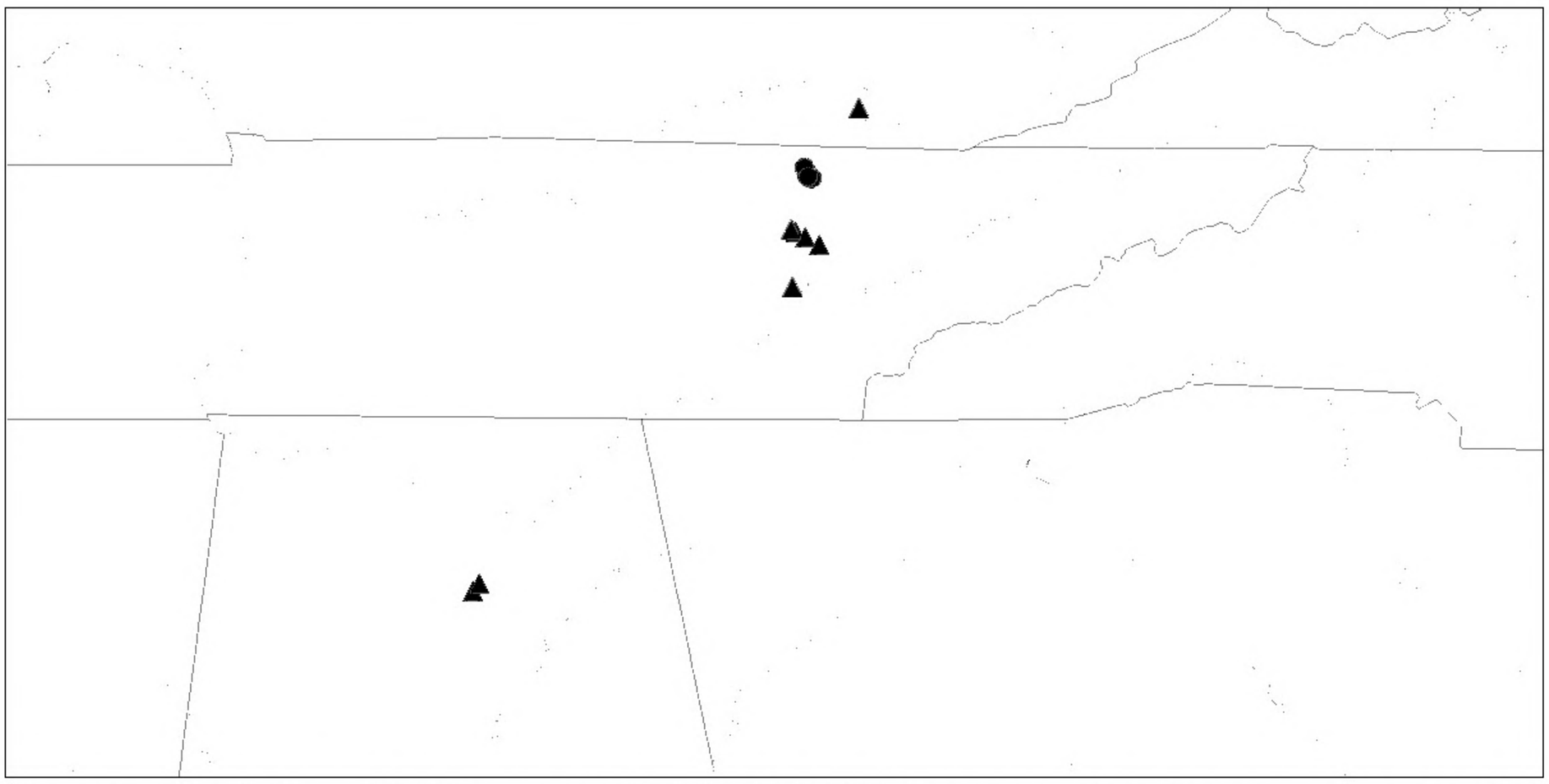

Figure 1. Distribution of *Solidago arenicola* (triangles) (KY site not seen, J. Peirson, pers. comm.) and *S. simplex* (circles) in Tennessee, Alabama, and Kentucky. Map created using http://www.simplemappr.net/.

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